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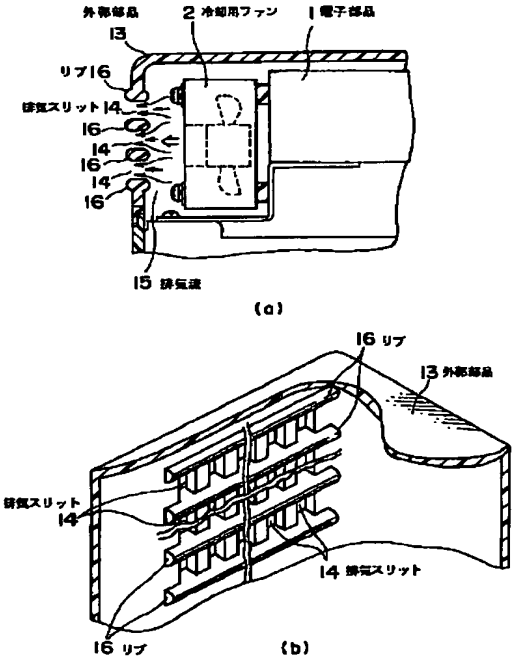
(54)【発明の名称】　小型電子機器の冷却構造

(57)【要約】

【目的】冷却能力の大きい冷却用ファンを用いなくても装置内が効率的に冷却でき、コストの低減およびファン騒音の低減が図れるようにする。

【構成】冷却用ファン２の排気側に対向するカバー等の外郭部品１３の面に、冷却用ファン２からの排気流１５を整流し、排気スリット１４での空気抵抗を低減するためのリブ１６を、排気スリット１４の列に沿って複数列設け、冷却用ファン２から排気スリット１４に送られた排気流１５が、排気スリット１４で大きな抵抗を受けずにこの排気スリット１４を通過して装置外に排出される構成とする。



1

【特許請求の範囲】

【請求項１】　冷却用ファンとこのファンの排気流を装置外部へ排出するための排気スリットとを備えた小型電子機器において、

前記排気スリットの周縁に少なくとも装置内に突出したリブを設け、

前記排気流を前記リブにより整流して前記排気スリットから装置外部へ排出するようにしたことを特徴とする小型電子機器の冷却構造。

【請求項２】　前記リブが曲面または傾斜面を有していることを特徴とする請求項１記載の小型電子機器の冷却構造。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】この発明は、ラップトップパーソナルコンピュータに代表される小型電子機器の冷却構造に関する。

【０００２】

【従来の技術】ラップトップパーソナルコンピュータに代表される小型電子機器においては、図５（ａ）の断面図に示すように、装置内部に各種の電子部品１が実装されている。これら電子部品１からは大きな発熱があり、その発熱量は高密度実装化に伴い増加の傾向にある。このため、信頼性確保や性能向上面から十分な冷却を行う必要がある。

【０００３】さて、装置内部の冷却には、一般に冷却用ファン２が用いられる。この冷却用ファン２は、装置内部の熱を集め、カバー等の装置外郭部品３に設けられた図５（ｂ）に詳細を示す排気スリット４の群を介して、排気流５として装置外に強制的に排出することにより、冷却する構造をとっている。

【０００４】ところが近年は、上記の高密度実装化に伴う発熱量の一層の増加で、装置内を十分に冷却することが困難となってきている。従来、これに対処するには、風量、静圧共により大きな冷却用ファン２を用いるしか方法がなかった。しかし、このような大型のファン２を用いた場合、コスト高やファン騒音の増加を招く他、省スペース化が困難である等の問題があった。

【０００５】

【発明が解決しようとする課題】上記したように従来の小型電子機器の冷却構造では、装置内の冷却能力を上げるためには、風量、静圧共により大きな冷却用ファンを用いるしか方法がなく、コスト高やファン騒音の増加を招くといった問題があった。

【０００６】この発明は上記事情に鑑みてなされたものでその目的は、冷却用ファンの排気流が排気スリットをスムーズに通過しないと排熱効率が悪くなって冷却性能が低下することに着目し、排気流に対する排気スリット部の抵抗を低減することにより、冷却能力の大きい冷却用ファンを用いなくても装置内が効率的に冷却でき、コストの低減およびファン騒音の低減が図れる小型電子機器の冷却構造を提供することにある。

2

【０００７】

【課題を解決するための手段】この発明は、冷却用ファンとこのファンの排気流を装置外部へ排出するための排気スリットとを備えた小型電子機器において、上記排気スリットの周縁に少なくとも装置内に突出したリブを設け、上記の排気流をこのリブにより整流して排気スリットから装置外部へ排出するようにしたことを特徴とするものである。また、この発明は、上記リブの整流効果を高めるために、同リブに曲面または傾斜面が形成された構造としたことも特徴とする。

【０００８】

【作用】上記の冷却構造において、装置内の各電子部品で発生された熱は冷却用ファンによって集められ、排気流として排気スリット側に送られる。排気スリットの周縁には、少なくとも装置内に突出したリブ（装置内と装置外の両側に突出したリブでもよい）が設けられ、そのリブには曲面または傾斜面が形成されている。この排気スリット周縁に設けられたリブにより、排気スリット部での空気抵抗が低減される。

【０００９】排気スリット部での抵抗が低減すると、冷却用ファンから排気スリット側に送られた排気流はこの排気スリットをスムーズに通過する。即ち冷却用ファンからの排気流は、リブにより整流されて排気スリット部に滞留することなくスムーズに装置外に排出される。

【００１０】このため、冷却用ファンを大型化しなくても、装置内を効率的に冷却することができるようなる。また、排気流が排気スリット部をスムーズに通過することから、風切り音も低減する。

【００１１】

【実施例】以下、この発明の一実施例を図面を参照して説明する。図１はこの発明の冷却構造を適用する小型電子機器の全体構成を示すもので、図１（ａ）は外観を示す斜視図、図１（ｂ）は図１（ａ）の小型電子機器のディスプレイ（１０）および一部外郭部品（１３）を外した状態を示す斜視図である。なお、図５と同一部分には同一符号を付してある。

【００１２】図１の小型電子機器は、例えばラップトップパーソナルコンピュータに代表されるものであり、同図（ａ）に示すようにキーボード１０およびディスプレイ１１等を有する。キーボード１０の後方には、本装置の筐体１２の一部をなす外郭部品１３が設けられている。この外郭部品１３は本装置の上カバーをなしている。

【００１３】外郭部品１３で保護された装置内には、図１（ｂ）に示すように、各種電子部品１が高密度に実装されている。また、外郭部品１３で保護された装置内には、各種電子部品１にて発生する熱を集めて、装置外へ排出するための冷却用ファン２も実装されている。

【００１４】図２は同実施例における冷却構造を示すもので、同図（ａ）は図１のＡ－Ａ線に沿う断面図、同図（ｂ）は上記外郭部品１３の一側面に設けられた排気スリット部の詳細構造を示すための斜視図である。

【００１５】図２（ａ）に示すように、冷却用ファン２の排気（吐出）側に対向する外郭部品１３の面には、多数の排気スリット１４が形成されている。この排気スリット１４は、図２（ｂ）に示すように縦横に（例えば縦１０列、横１０列に）配列されている。排気スリット１４のスリット幅（横方向長）は例えば３㎜、スリット長（縦方向長）は例えば３．５㎜である。また、横方向の排気スリット１４相互間の間隔は例えば２㎜、縦方向の排気スリット１４相互間の間隔は例えば１．５㎜である。

【００１６】排気スリット１４の群が形成された外郭部品１３の面には、冷却用ファン２からの排気流１５を整流し、排気スリット１４での空気抵抗を低減するためのリブ１６が、排気スリット１４の横方向列に沿って複数列（ここでは、排気スリット１４の横方向列の数＋１、即ち１１列）形成されている。このリブ１６は、図２（ａ）に示すように装置内と装置外の２方向に突出しており、その突出部分は、断面が例えば半径０．７５㎜の半円形の曲面となっている。

【００１７】なお、図２（ａ）では、作図の都合上、排気スリット１４の横方向列数が上記の１０列でなくて３列、リブ１６の列が上記の１１列でなくて４列である状態が示されている。

【００１８】次に、図１に示す小型電子機器における図２に示す冷却構造による装置内冷却作用について説明する。まず、装置内の各電子部品１で発生された熱は冷却用ファン２によってその吸気（吸込）側から集められ、その排気（吐出）側から排気流１５として排気スリット１４側に送られる。

【００１９】排気スリット１４の周縁には、その排気スリット１４の横方向列に沿ってリブ１６が設けられている。このリブ１６の突出部は、断面形状が半円形の曲面となっており、排気流１５に対する排気スリット１４での抵抗が低減される構造となっている。このため、冷却用ファン２から排気スリット１４に送られた排気流１５は、この排気スリット１４で大きな抵抗を受けずに、この排気スリット１４をスムーズに通過する。即ち、冷却用ファン２から送られた排気流１５は、リブ１６により整流され、排気スリット１４近傍に滞留することなく、スムーズに装置外に排出される。

【００２０】このように、図２に示す冷却構造では、排気流１５が排気スリット１４からスムーズに排出されることから、即ち排熱がスムーズに行われることから、冷却用ファン２の能力を十分に生かすことができる。このため、冷却用ファン２を大型化しなくても、装置内を効率的に冷却することができる。また、排気流１５が排気

スリット１４をスムーズに通過することから、風切り音が低減する。

【００２１】これに対し、リブ（１６）を持たない図５に示した従来の冷却構造では、（本実施例における排気スリット１４に相当する）排気スリット４での抵抗が極めて大きいため、（本実施例における排気流１５に相当する）排気流５は排気スリット４から装置外にスムーズに排出されずに装置内部へ還流してしまう。即ち図５に示す従来の冷却構造では、排熱がスムーズに行われないため、冷却用ファン２の能力を十分に生かすことができず、冷却性能の低下を招いていた。また、排気流５は排気スリット４近傍で渦流となり、排気スリット４で大きな抵抗を受けて同スリット４を通過するために、その通過の際に風切り音が発生し、利用者に不快感を与えていた。

【００２２】以上に述べた図２に示す冷却構造を適用した図１の小型電子機器内の例えば９つのポイント（便宜上ａ，ｂ…ｉとする）での温度測定結果を、リブ１６を持たない場合の同一ポイントでの温度測定結果（リブ１６を持たない点を除き、小型電子機器の構造、測定条件等は同一）と対比して図３に示す。この図３から明らかなように、本実施例によれば、冷却用ファン２を変えなくても、装置内温度を従来に比べて４℃近く下げることができる。

【００２３】なお、前記実施例では、リブ１６が排気スリット１４の横方向列に沿って設けられている場合について説明したが、これに限るものではなく、例えば、排気スリット１４の縦方向列に沿って設けられていても、あるいは排気スリット１４の横方向列および縦方向列に沿って縦横に設けられていても構わない。

【００２４】また、前記実施例では、リブ１６の突出部の断面形状が半円形であるものとして説明したが、図４（ａ）に示すリブ２６のように半楕円形であってもよく、排気流（１５）が排気スリット１４をスムーズに通過できる曲面を持っていればよい。更に、図４（ｂ）に示すリブ３６のように、突出部に傾斜面を持つリブ構造であってもよく、排気流（１５）に対する排気スリット１４での抵抗を低減できるリブ構造であればよい。また、図４（ｃ）に示すリブ４６のように、装置外に向かう突出部を持たないものであってもよい。ただし、この図４（ｃ）に示すリブ構造では、排気スリット１４の出口近傍での渦流発生を防ぐことができず、したがって冷却性能向上への寄与率は多少低下する。

【００２５】

【発明の効果】以上詳述したようにこの発明によれば、冷却用ファンの排気流を装置外部へ排出するための排気スリットの周縁に少なくとも装置内に突出したリブを設け、上記の排気流をこのリブにより整流して排気スリットを通過させるようにしたので、次に列挙する作用効果を得ることができる。

5

【００２６】（１）　排気流が排気スリット近傍に滞留せずにスムーズに装置外に排出されるようになり、即ち排熱が効率的に行われるようになり、したがって冷却用ファンの能力を十分に生かすことができる。

（２）　排気流が排気スリットからスムーズに装置外に排出されるため、排気スリットを通過する際に発生する風切り音を低減することができる。

【００２７】（３）　冷却用ファンの能力を十分に生かすことができることから、風量、静圧のより小さな冷却用ファンの選定が可能となり、コストの低減およびファン騒音の低減を図ることができる。また、冷却用ファンの設置スペースも小さくて済む。

【図面の簡単な説明】

6

【図１】この発明の一実施例に係る小型電子機器の全体構成を示す斜視図。

【図２】図１の小型電子機器に適用されている冷却構造を示す図。

【図３】図２に示す冷却構造を適用した小型電子機器内の各ポイントでの温度測定結果を、リブを持たない場合の同一ポイントでの温度測定結果と対比して示す図。

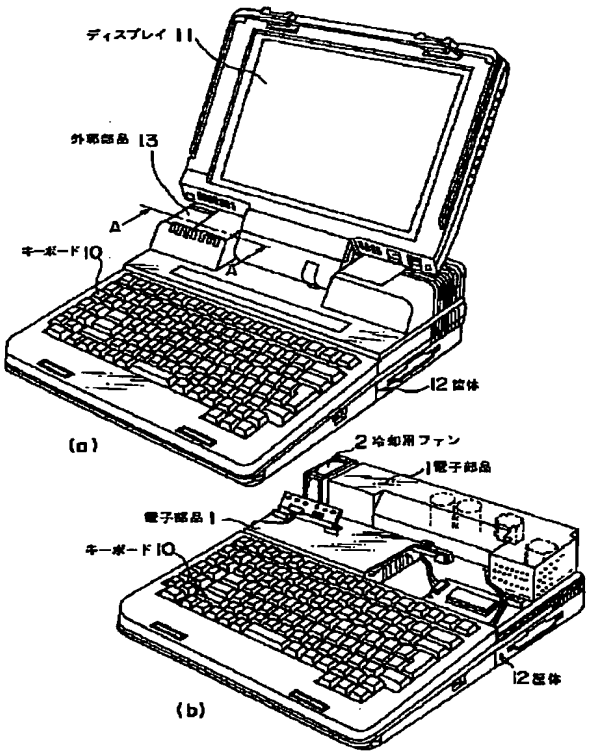
【図４】リブの変形例を示す図。

【図５】従来の小型電子機器の冷却構造を示す図。

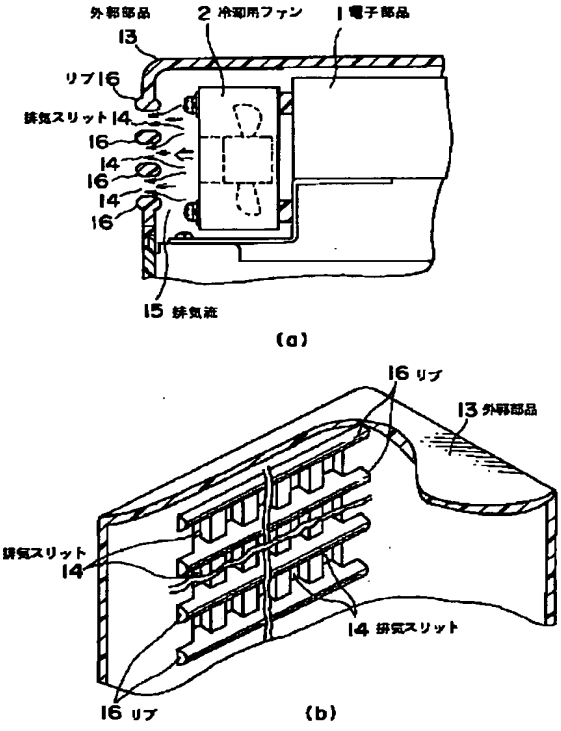
【符号の説明】

１…電子部品、２…冷却用ファン、１２…筐体、１３…外郭部品、１４…排気スリット、１５…排気流、１６，２６，３６，４６…リブ。

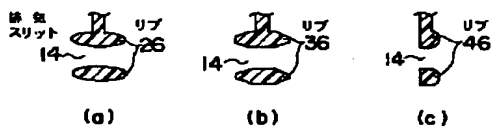
【図１】



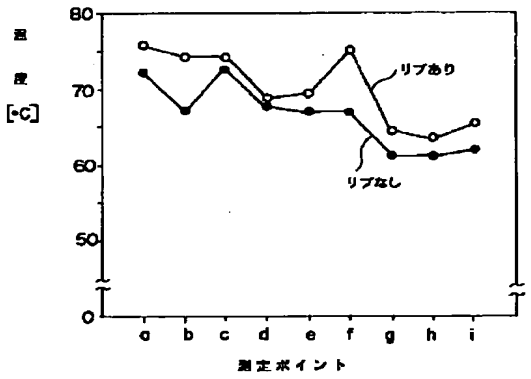
【図２】



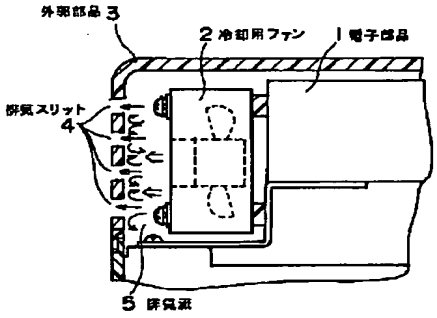
【図４】

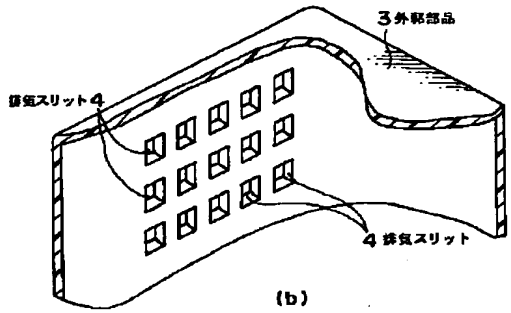


【図3】


温度 [°C]
80
70
60
50
0
リブあり
リブなし
a b c d e f g h i
測定ポイント

【図5】


外装部品 3
2 冷却用ファン
1 電子部品
排気スリット 4
5 排気流
(a)


3 外装部品
排気スリット 4
4 排気スリット
(b)

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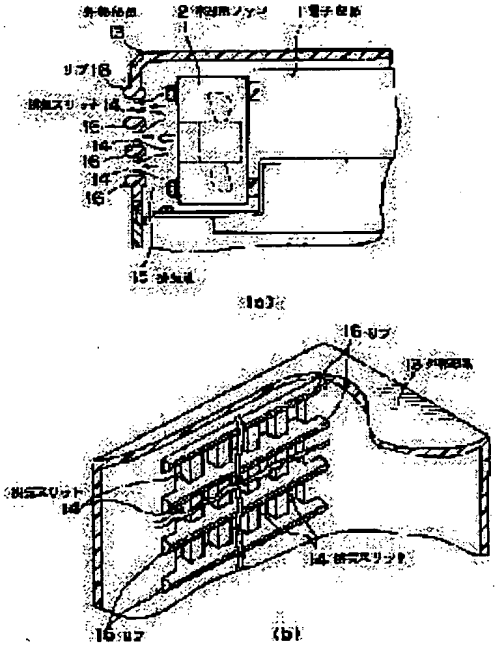
(71)Applicant : TOSHIBA CORP
(72)Inventor : TAKEDA FUMIAKI

(54) COOLING STRUCTURE FOR SMALL-SIZED ELECTRONIC APPARATUS

(57)Abstract:
PURPOSE: To reduce the cost and the fan noise by efficiently cooling the inside of a device without using a cooling fan which has a high cooling capability.
CONSTITUTION: Plural arrays of ribs 16 which straighten an exhaust air current 15 from a cooling fan 2 to reduce the air resistance in exhaust slits 14 are provided along arrays of exhaust slits 14 on the face of housing parts 13 like a cover facing the exhaust side of the cooling fan 2 so that the exhaust air current 15 sent from the cooling fan 2 to exhaust slits 14 passes. through exhaust slits 14 without receiving a high resistance due to exhaust slits 14 and is discharged out of the device.



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Summary

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(57) [Abstract]
[Objects of the Invention] Even if it does not use the large fan for cooling of refrigeration capacity, the inside of equipment can cool efficiently, and it enables it to aim at reduction of cost, and reduction of fan noise.
[Elements of the Invention] To the field of the outline parts 13, such as covering which counters the exhaust side of the fan 2 for cooling The rib 16 for rectifying the exhaust stream 15 from the fan 2 for cooling, and reducing the air resistance in the exhaust air slit 14 The exhaust stream 15 sent to the exhaust air slit 14 from two or more ****** and the fan 2 for cooling in accordance with the train of the exhaust air slit 14 considers as the composition which passes this exhaust air slit 14, without receiving strong resistance to the exhaust air slit 14, and is discharged out of equipment.

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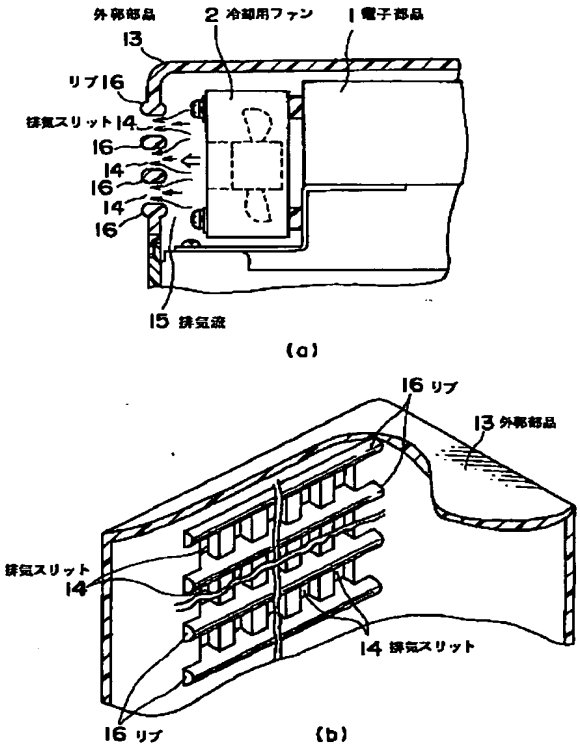

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CLAIMS

[Claim(s)]
[Claim 1] Cooling structure of the small electronic equipment characterized by preparing the rib projected in equipment at least in the periphery of the aforementioned exhaust air slit in small electronic equipment equipped with the exhaust air slit for discharging the exhaust stream of the fan for cooling, and this fan to the equipment exterior, and the aforementioned rib rectifying the aforementioned exhaust stream, and making it discharge from the aforementioned exhaust air slit to the equipment exterior.
[Claim 2] Cooling structure of the small electronic equipment according to claim 1 characterized by the aforementioned rib having the curved surface or the inclined plane.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the cooling structure of the small electronic equipment represented by the laptop personal computer.
[0002]
[Description of the Prior Art] In the small electronic equipment represented by the laptop personal computer, as shown in the cross section of drawing 5 (a), various kinds of electronic parts 1 are mounted in the interior of equipment. There is big generation of heat from these electronic parts 1, and the calorific value is increasing with high-density-assembly-izing. For this reason, it is necessary to perform reliability reservation and cooling sufficient from the improvement side in a performance.
[0003] Now, generally the fan 2 for cooling is used for cooling inside equipment. This fan 2 for cooling has taken the structure to cool by collecting the heat inside equipment and discharging compulsorily out of equipment as an exhaust stream 5 through the group of the exhaust air slit 4 which shows a detail to drawing 5 (b) prepared in the equipment outline parts 3, such as covering.
[0004] However, it is much more increase in the calorific value accompanying the above-mentioned high-density-assembly-izing in recent years, and it is becoming difficult to fully cool the inside of equipment. In order to have coped with this conventionally, the method only had that air capacity and static pressure used the big fan 2 for cooling. however, when such a large-sized fan 2 is used, the increase in cost quantity or fan noise is caused, and also the formation of a ** space is difficult -- etc. -- there was a problem
[0005]
[Problem(s) to be Solved by the Invention] As described above, a method only has that air

capacity and static pressure use the big fan for cooling in order to raise the refrigeration capacity in equipment with the cooling structure of the conventional small electronic equipment, and there was a problem of causing the increase in cost quantity or fan noise.
[0006] This invention is what was made in view of the above-mentioned situation. the purpose Paying attention to exhaust heat efficiency becoming bad and a cooling performance falling, if the exhaust stream of the fan for cooling does not pass an exhaust air slit smoothly, by reducing resistance of the exhaust air slit section to an exhaust stream Even if it does not use the large fan for cooling of refrigeration capacity, the inside of equipment can cool efficiently, and it is in offering the cooling structure of small electronic equipment where reduction of cost and reduction of fan noise can be aimed at.
[0007]
[Means for Solving the Problem] This invention is characterized by preparing the rib projected in equipment at least in the periphery of the above-mentioned exhaust air slit, and this rib rectifying the above-mentioned exhaust stream, and making it discharge from an exhaust air slit to the equipment exterior in small electronic equipment equipped with the exhaust air slit for discharging the exhaust stream of the fan for cooling, and this fan to the equipment exterior. Moreover, this invention is characterized also by considering as the structure where the curved surface or the inclined plane was formed in this rib, in order to heighten the rectification effect of the above-mentioned rib.
[0008]
[Function] In the above-mentioned cooling structure, the heat generated with each electronic parts in equipment is collected by the fan for cooling, and is sent to an exhaust air slit side as an exhaust stream. The rib (the rib projected on both sides the inside of equipment and besides equipment is sufficient) projected in equipment at least is prepared in the periphery of an exhaust air slit, and the curved surface or the inclined plane is formed in the rib. With the rib prepared in this exhaust air slit periphery, the air resistance in the exhaust air slit section is reduced.
[0009] ** [reduction of resistance in the exhaust air slit section / pass / smoothly / this exhaust air slit / the exhaust stream sent to the exhaust air slit side from the fan for cooling] That is, the exhaust stream from the fan for cooling is smoothly discharged out of equipment, without being rectified by the rib and piling up in the exhaust air slit section.
[0010] For this reason, even if it does not enlarge the fan for cooling, it becomes as [cool / efficiently / the inside of equipment]. Moreover, since an exhaust stream passes the exhaust air slit section smoothly, a whizzing sound is also reduced.
[0011]
[Example] Hereafter, one example of this invention is explained with reference to a drawing. Drawing 1 shows the whole small electronic equipment composition which applies the cooling structure of this invention, and the perspective diagram in which drawing 1 (a) shows appearance, and drawing 1 (b) are the perspective diagrams showing the display (10) and the state where outline parts (13) were removed in part of small electronic equipment of drawing 1 (a). In addition, the same sign is given to the same portion as drawing 5 .
[0012] The small electronic equipment of drawing 1 is represented by for example, the laptop personal computer, and as shown in this drawing (a), it has a keyboard 10 and display 11 grade. Behind the keyboard 10, the outline parts 13 which make a part of case 12 of this equipment are formed. This outline part 13 is making the arm top cover of this equipment.
[0013] In the equipment protected with the outline parts 13, as shown in drawing 1 (b), the various electronic parts 1 are mounted with high density. Moreover, in the equipment protected with the outline parts 13, the heat generated with the various electronic parts 1 is collected, and the fan 2 for cooling for discharging out of equipment is also mounted.
[0014] Drawing 2 shows the cooling structure in this example, and the cross section with which this drawing (a) meets the A-A line of drawing 1 , and this drawing (b) are perspective diagrams for the detailed structure of the exhaust air slit section prepared in the unilateral side of the above-mentioned outline parts 13 being shown.
[0015] As shown in drawing 2 (a), many exhaust air slits 14 are formed in the field of the outline

parts 13 which counter the exhaust air (regurgitation) side of the fan 2 for cooling. This exhaust air slit 14 is arranged in all directions, as shown in drawing 2 (b) (in for example, vertical 10 train and width 10 train). The slit width (longitudinal direction length) of the exhaust air slit 14 is 3mm, and slit length (lengthwise length) is 3.5mm. Moreover, the interval between [2mm and lengthwise] exhaust air slit 14 in the lateral interval between exhaust air slit 14 is 1.5mm.
[0016] In the field of the outline parts 13 in which the group of the exhaust air slit 14 was formed, the exhaust stream 15 from the fan 2 for cooling is rectified, and two or more trains (here several +1, 11 [i.e.,], trains of longitudinal direction train of exhaust air slit 14) formation of the rib 16 for reducing the air resistance in the exhaust air slit 14 is carried out in accordance with the longitudinal direction train of the exhaust air slit 14 in it. This rib 16 is projected to the 2-way the inside of equipment, and besides equipment, as shown in drawing 2 (a), and the amount of the lobe has become the curved surface of the semicircle whose cross section is the radius of 0.75mm.
[0017] In addition, by drawing 2 (a), on account of the plot, the numbers of longitudinal direction trains of the exhaust air slit 14 are not the ten above-mentioned trains, it is not three trains and 11 trains of the above [the train of a rib 16], and the state of being four trains is shown.
[0018] Next, the cooling operation in equipment by the cooling structure shown in drawing 2 in the small electronic equipment shown in drawing 1 is explained. First, the heat generated with each electronic parts 1 in equipment is collected from the inhalation-of-air (intake) side by the fan 2 for cooling, and is sent to the exhaust air slit 14 side as an exhaust stream 15 from the exhaust air (regurgitation) side.
[0019] In accordance with the longitudinal direction train of the exhaust air slit 14, the rib 16 is formed in the periphery of the exhaust air slit 14. The cross-section configuration serves as a curved surface of a semicircle, and the lobe of this rib 16 has the structure where resistance to the exhaust air slit 14 to an exhaust stream 15 is reduced. For this reason, the exhaust stream 15 sent to the exhaust air slit 14 from the fan 2 for cooling passes this exhaust air slit 14 smoothly, without receiving strong resistance to this exhaust air slit 14. That is, the exhaust stream 15 sent by the fan 2 for cooling is smoothly discharged out of equipment, without being rectified by the rib 16 and piling up in about 14 exhaust air slit.
[0020] Thus, with the cooling structure shown in drawing 2 , since an exhaust stream 15 being smoothly discharged from the exhaust air slit 14 to exhaust heat is performed smoothly, the capacity of the fan 2 for cooling can fully be employed efficiently. For this reason, even if it does not enlarge the fan 2 for cooling, the inside of equipment can be cooled efficiently. Moreover, since an exhaust stream 15 passes the exhaust air slit 14 smoothly, a whizzing sound decreases.

[0021] On the other hand, with the conventional cooling structure shown in drawing 5 without a rib (16), since resistance to the exhaust air (it is equivalent to exhaust air slit 14 in this example) slit 4 is very strong, an exhaust stream (it is equivalent to the exhaust stream 15 in this example) 5 will flow back inside equipment, without being smoothly discharged out of equipment from the exhaust air slit 4. That is, with the conventional cooling structure shown in drawing 5 , since exhaust heat was not performed smoothly, capacity of the fan 2 for cooling could not fully be employed efficiently, but cooling performance degradation had been caused. Moreover, the whizzing sound occurred on the occasion of the passage, and the exhaust stream 5 had given the user displeasure, in order to become a vortex to about four exhaust air slit and to pass this slit 4 in response to strong resistance to the exhaust air slit 4.
[0022] The thermometry result in the small electronic equipment of drawing 1 which applied the cooling structure shown in drawing 2 stated above (for example, the nine points) (it considers as a and b--i for convenience) is shown in drawing 3 as contrasted with the thermometry result (except for a point without a rib 16, the structure of small electronic equipment, measurement conditions, etc. are the same) in the same point when not having a rib 16. Even if it does not change the fan 2 for cooling, according to this example, compared with the former, about 4 degrees C of temperature in equipment can be lowered, so that clearly from this drawing 3 .
[0023] In addition, although the case where the rib 16 was formed in accordance with the longitudinal direction train of the exhaust air slit 14 was explained, the aforementioned example

is available, whether do not restrict to this, and it is prepared in accordance with the lengthwise train of the exhaust air slit 14, or it is prepared in all directions in accordance with the longitudinal direction train and lengthwise train of the exhaust air slit 14.
[0024] Moreover, what is necessary is to be half-ellipse type like the rib 26 shown in drawing 4 (a), and just to have the curved surface on which an exhaust stream (15) can pass the exhaust air slit 14 smoothly, although the aforementioned example explained as that whose cross-section configuration of the lobe of a rib 16 is a semicircle. Furthermore, to be the rib structure which has an inclined plane in a lobe like the rib 36 shown in drawing 4 (b), and what is necessary is just the rib structure where resistance to the exhaust air slit 14 to an exhaust stream (15) can be reduced. Moreover, you may not have the lobe which goes out of equipment like the rib 46 shown in drawing 4 (c). However, with the rib structure shown in this drawing 4 (c), vortex generating near the outlet of the exhaust air slit 14 cannot be prevented, therefore some rates of contribution to the improvement in a cooling performance fall.
[0025]
[Effect of the Invention] Since the rib projected in equipment at least is prepared in the periphery of the exhaust air slit for discharging the exhaust stream of the fan for cooling to the equipment exterior according to this invention as explained in full detail above, this rib rectifies the above-mentioned exhaust stream and it was made to pass an exhaust air slit, the operation effect of next enumerating can be acquired.
[0026] (1) It comes to be smoothly discharged out of equipment, without an exhaust stream piling up near the exhaust air slit, exhaust heat comes to be performed efficiently, therefore the capacity of the fan for cooling can fully be employed efficiently.
(2) Since an exhaust stream is smoothly discharged out of equipment from an exhaust air slit, the whizzing sound generated in case an exhaust air slit is passed can be reduced.
[0027] (3) Since the capacity of the fan for cooling can fully be employed efficiently, selection of the fan for cooling smaller than air capacity and a static pressure's is attained, and reduction of cost and reduction of fan noise can be aimed at. Moreover, the installation space of the fan for cooling is also small, and ends.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The perspective diagram showing the whole small electronic equipment composition concerning one example of this invention.
[Drawing 2] Drawing showing the cooling structure applied to the small electronic equipment of drawing 1 .
[Drawing 3] Drawing showing the thermometry result in each point in the small electronic equipment which applied the cooling structure shown in drawing 2 as contrasted with the thermometry result in the same point when not having a rib.
[Drawing 4] Drawing showing the modification of a rib.

[Drawing 5] Drawing showing the cooling structure of the conventional small electronic equipment.
[Description of Notations]
1 [-- A case, 13 / -- Outline parts, 14 / -- An exhaust air slit, 15 / -- An exhaust stream, 16 26, 36, 46 / -- Rib.] -- Electronic parts, 2 -- The fan for cooling, 12

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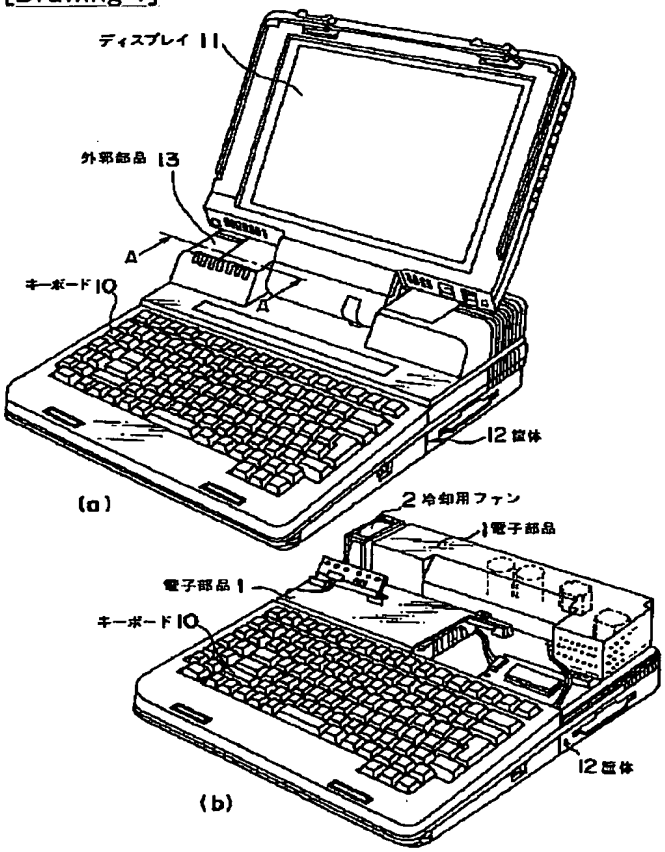
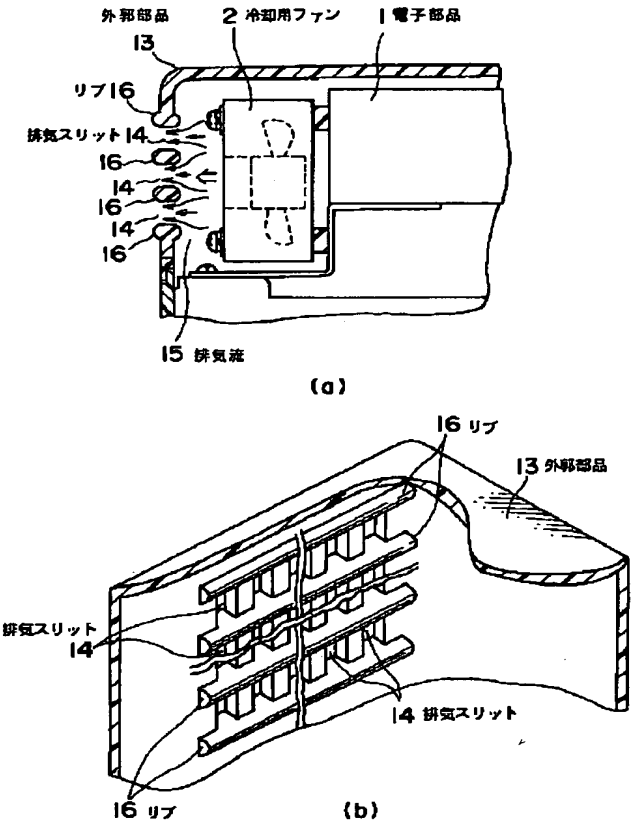
DRAWINGS

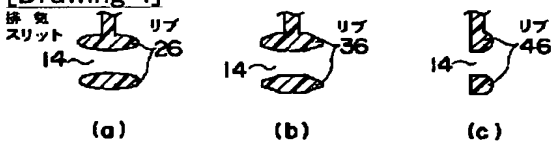
[Drawing 1]



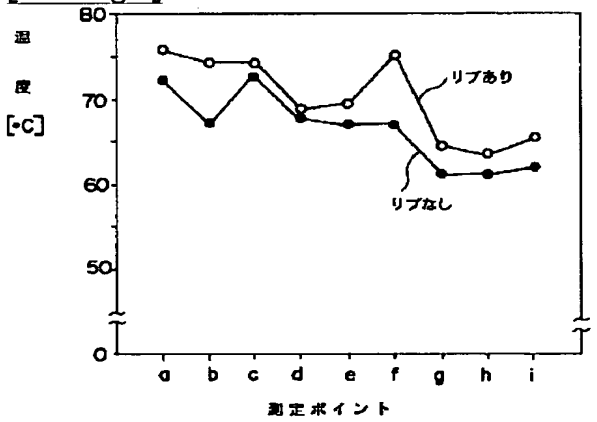
[Drawing 2]



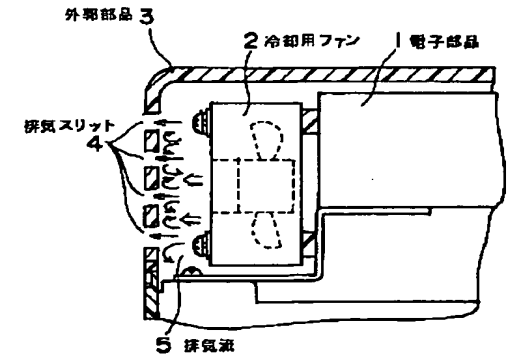
[Drawing 4]



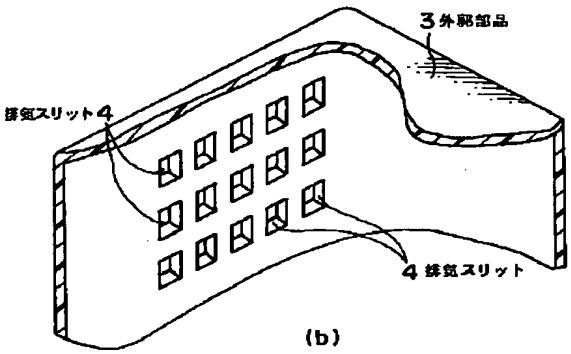
[Drawing 3]



[Drawing 5]



(a)



(b)

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